



SBIR

Small Business Innovation Research Program

ABSTRACTS OF AWARDS FOR FISCAL YEAR 2001

U.S. DEPARTMENT OF COMMERCE

INTRODUCTION

The Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), through the Small Business Innovation Research (SBIR) program, awarded 13 Phase 1 contracts for FY 2001. These awards of up to \$75,000 each, and totaling approximately \$850,000, are for a 6-month effort to demonstrate the feasibility of innovative approaches to the research topics identified in the "DOC SBIR Program Solicitation for FY 2001 (DOC 2001-1)." Abstracts of the successful Phase 1 proposals submitted under this solicitation, and brief comments on their potential commercial applications, are provided in this publication.

In Phase 2, funding is provided for projects that are most promising after Phase 1 is completed. These awards can be for up to \$300,000 each and for two years. Phase 3 uses non-SBIR funding to pursue potential commercial applications of the project. The DOC/NOAA awarded a total of 7 Phase 2 contracts in FY 2001 for a total of approximately \$1.7 million. Abstracts of successful Phase 2 proposals and comments on their commercial applications are also provided in this solicitation.

The SBIR program is highly competitive. A total of about 150 proposals were received by DOC/NOAA in response to its FY 2001 solicitation. The proposals were independently reviewed by DOC/NOAA scientists and/or engineers. With the funds available, only 13 could be selected. Final selection was based upon the results of the reviews, relative importance to DOC/NOAA needs, relationship to on-going research, and potential for commercialization.

FY 2001 PHASE 1 AWARD WINNER

TOPIC: 8.1 Atmospheric Sciences

SUBTOPIC: 8.1.1R Long Lived, Vertically Controllable, Superpressure Balloon Vehicle for Deployment of In-situ Environmental Sensors

TITLE: 3DR Superpressure Balloon for Deployment of In-situ Environmental Sensors

FIRM: GSSL, Inc.
P.O. Box 673
Tillamook, OR 97141-0673

PRINCIPAL INVESTIGATOR: Koh Murai
503-842-1990

AWARD AMOUNT: \$75,000

ABSTRACT:

This proposal will demonstrate the feasibility of applying GSSL's 3DR space inflatable technology to a vertically-controllable superpressure balloon platform. Today, global measurements of regional atmospheric, meteorologic, and oceanic parameters are unobtainable in a real time basis. These measurements could lead to improved environmental policy decisions and further scientific understanding of weather, greenhouse gases, and oceanic processes. GSSL and their strategic partner North Sails are in a leadership position to advance a technology proven in high performance sails to the balloon and inflatables market. Phase 1 work will include a prototype 3DR balloon design, materials selection and evaluation, preparation and testing of samples using 3DR processes, and an adaptation of GSSL's proprietary balloon envelope recovery system. The Phase 1 effort will provide the foundation for the fabrication and flight-testing of a prototype 3DR balloon vehicle during Phase 2. Finally, the commercial application of the technology to both wind tracer balloons and scientific research platforms will be addressed.

COMMERCIAL APPLICATIONS:

3DR technology can be applied to creation of long duration stratospheric balloon platforms. These platforms can be used for a wide array of commercial remote sensing applications including atmospheric and oceanic observations, communications and space craft components validation. Embedded sensors in the balloon itself can augment other observations in the payload section. Cost effective Wind Tracer balloons can utilize this application for long duration observations at various altitudes by government, education institutions, and private researchers

FY 2001 PHASE 1 AWARD WINNER

TOPIC: 8.1 Atmospheric Sciences

SUBTOPIC: 8.1.2R Robust, Precise CO₂ Analyzer for Unattended Field Use

TITLE: High Precision Monitoring Instrumentation for the Earth's CO₂ Background

FIRM: Atmospheric Observing Systems
8022 Countryside Park #234
Niwot, CO 80503

PRINCIPAL INVESTIGATOR: James R. Smith
303-817-6854

AWARD AMOUNT: \$75,000

ABSTRACT:

Atmospheric Observing Systems (AOS) has designed, build, and deployed the world's most sensitive and stable analyzers to measure the air-sea flux of carbon dioxide of the open ocean. This proposal explains how the analyzers can be modified to satisfy NOAA's needs. Three designs are proposed to determine which can best satisfy NOAA's goal to track and quantify the global carbon cycle by observations of the CO₂ background from all of it's terrestrial platforms, air, sea, and ground. Commercial opportunities should be substantial because the designs are based on what atmospheric scientists do to quantify the CO₂ background And what they require in terms of sensitivity, stability of observing conditions, and supplies of reference gases.

COMMERCIAL APPLICATIONS:

1. Analyzers for continuous monitoring of the CO₂ background at remote sites, air, sea, and ground.
2. Analyzers for laboratory samples of air

FY 2001 PHASE 1 AWARD WINNER

TOPIC: 8.1 Atmospheric Sciences

SUBTOPIC: 8.1.3R Laser for Unattended Atmospheric Water Vapor Profiler

TITLE: Low Cost Ti: Sapphire Laser for DIAL

FIRM: Q-Peak, Inc.
135 South Road
Bedford, MA 01730-2307

PRINCIPAL INVESTIGATOR: John H. Flint
781-275-9535

AWARD AMOUNT: \$74,770

ABSTRACT:

We propose to design a low-cost, rugged, DIAL transmitter that could be used by NOAA to monitor water vapor concentrations in the atmosphere. The transmitter will consist of an injection-seeded Titanium: Sapphire laser pumped by a passively Q-switched Nd:YLF laser. The seeding will be performed by an external-cavity diode laser, which will be frequency-modulated to tune the Ti:Sapphire laser on and off a strong water vapor absorption line. Although this design appears to be rather complex, the technology exists today to build a reliable, long-lived device that does not require periodic alignment of tuning. Its costs will be low due to a relatively small parts count; the absence of moving or adjustable parts; and passive, conduction cooling. Diode lasers and semiconductor amplifiers are not powerful enough to compete with the Ti:Sapphire laser in this application. The Phase 1 effort will consist of a demonstration of the passively Q-switched pump laser performance, and of rapid tuning of an existing Ti:Sapphire ring laser, and of the detailed opto-mechanical design of the DIAL transmitter to be constructed during the Phase 2 effort. A complete working prototype, including microprocessor control, would be the product of Phase 2.

COMMERCIAL APPLICATIONS:

Potential commercial applications include pollution detection, chemical and biological weapons detection, and upper atmosphere studies. Passively Q-switched lasers can also be used in materials processing, and in other remote sensing applications such as range finding and target designation.

FY 2001 PHASE 1 AWARD WINNER

TOPIC: 8.1 Atmospheric Sciences

SUBTOPIC: 8.1.6W Observing Station Meta Data System

TITLE: Observing Station Metadata System

FIRM: Mayur Technologies
238 Amberleigh Drive
Silver Spring, MD 20905

PRINCIPAL INVESTIGATOR: Ramachandran Suresh
301-464-2542

AWARD AMOUNT: \$74,997

ABSTRACT:

We propose to develop a web based system for submitting metadata for the users of NWS Cooperative Weather Observation network. This system will provide a user interface for entering site metadata and observation data from field sites. A Java applet embedded in the browser will be linked to the Oracle database through Java Database connectivity (JDBC). The architecture will also have the ability to receive and store digital camera input from field offices. Oracle flow will be used for quality control. We will build a prototype to demonstrate the architecture and functionality of the system.

The system architecture defined in this proposal will meet the requirements of NWS and will provide a framework to accommodate new technologies such as XML. The system will be able to receive and submit metadata using wireless applications such as PDA and cell phone. The XML and wireless technologies mentioned above will not be part of the prototype system, but will provide a framework that will make it easy to implement these features in the future.

Mayur technologies staff have extensive experience in dealing with metadata from multiple remote sensing instruments. They have developed a web based metadata catalog system for NASA.

COMMERCIAL APPLICATIONS:

Web based metadata catalog systems are required to manage vast archives of data in many federal (NASA, NOAA, US Geological Survey, Federal Emergency Management Agency, and Environmental Protection Agency), state, and local agencies and also in the commercial sector. Therefore, the software tools developed in this project have potential application in many other projects.

FY 2001 PHASE 1 AWARD WINNER

TOPIC: 8.2 Ocean Observation Systems

SUBTOPIC: 8.2.2GP Autonomous Analyzers for Measurement of Air-Sea CO₂ Fluxes

TITLE: Development of an Autonomous System for Quantifying Air-Sea Fluxes

FIRM: Sunburst Sensors, LLC
910 South 3rd St. West
Missoula, MT 59801-2340

PRINCIPAL INVESTIGATOR: David E. Irwin
406-549-9267

AWARD AMOUNT: \$75,000

ABSTRACT:

The oceans sequester a large fraction of anthropogenic CO₂ emitted to the atmosphere, but the magnitude of the flux, and its potential alteration through climate change are highly uncertain. Our understanding is primarily limited by our ability to adequately characterize ocean CO₂ variability. Autonomous at-sea measurements of the partial pressure of CO₂ (*p*CO₂) in seawater and air would allow oceanographers to continuously record air-sea CO₂ fluxes in many different locations, providing the necessary data to quantify and understand ocean sequestration. A variety of autonomous CO₂ sensors have been extensively used on moorings and drifters, but for reasons explained in the proposal, they are not amenable to widespread use. The objective of the present proposal is to modify an existing sensor, the Submersible Autonomous Moored Instrument for CO₂, or SAMI-CO₂, to provide more reliable data at lower cost. More specifically the proposed work aims to:

1. develop a combined atmospheric *p*CO₂ and seawater *p*CO₂ system by redesigning the sensor configuration to allow measurement of atmospheric CO₂.
2. implement a novel optical design to improve light throughput, increasing the signal-to-noise ratio and decreasing size and cost.
3. test different membrane configurations to reduce biofouling.

COMMERCIAL APPLICATIONS:

Global warming and ocean carbon cycle research, studies involving the health of fisheries, water quality analysis, monitoring of industrial processes.

FY 2001 PHASE 1 AWARD WINNER

TOPIC: 8.3 Living Marine Resources

SUBTOPIC: 8.3.2F Shrimp Virus Disinfection Techniques for Aquaculture, etc.

TITLE: Resonant Sonic Ozone Treatment Technology (RSOTT) for Aquaculture Effluent Disinfection

FIRM: Montec Research
1901 S. Franklin
Butte, MT 59701

PRINCIPAL INVESTIGATOR: Steve McGrath
406-723-2222

AWARD AMOUNT: \$75,000

ABSTRACT:

A novel acoustically driven ozone contacting system is proposed for disinfection of aquaculture effluents. Ozone treatment has been demonstrated to be an effective method of inactivating shrimp viruses. The chemistry of aquaculture water presents difficulty for ozone systems because of high ozone demand created by bromide and organic matter. An ozone contact system must have sufficient mass transport capability to provide the concentration of residual ozone necessary to disinfect in the presence of the ozone demand. The RSOTT system utilizes intense low frequency acoustic energy to "pump" the ozone into solution, providing the residual free ozone concentration necessary to achieve the concentration-time (CT) dosage for viral inactivation in a very short time. The Phase 1 project will demonstrate feasibility in the laboratory using aquaculture effluent collected from a research facility in Texas and fortified with WSSV cultures grown at the University of Hawaii. Production of bromate will be monitored.

COMMERCIAL APPLICATIONS:

The RSOTT system is a generally applicable ozone contacting system for use in water treatment and disinfection. It is characterized by high mass transport and simple, robust operating technology. As such, it should find applications in general aquaculture practice as an economical and effective means to maintain disease free status.

FY 2001 PHASE 1 AWARD WINNER

TOPIC: 8.4 Ocean Science

SUBTOPIC: 8.4.1SG Open-Ocean Aquaculture Systems

TITLE: Controlled Production of Cobia (Rachycentron canadum) Juveniles from Captured Wild Adults in Tanks and Ponds

FIRM: Southland Fisheries Corporation
600 Old Bluff Road
Hopkins, SC 29061

PRINCIPAL INVESTIGATOR: Jesse A. Chappell
803-776-4923

AWARD AMOUNT: \$50,000

ABSTRACT:

Larviculture of marine finfish to juvenile stage is a major bottleneck to commercial marine aquaculture. Through recent research efforts in habituation, maturation, and diet development, high value broodstocks have produced high quality eggs/larvae in captivity. Culture of larvae using live foods is now possible, if the foods are HUFA enriched in some effective way. This Phase 1 research focuses on Cobia (Rachycentron canadum), a high value marine finfish exhibiting remarkable growth rates in culture. Our objectives are to: 1) habituate, mature, and tank spawn wild adults; and 2) rear their larvae in an indoor, controlled intensive system using nutritionally enriched zooplankton; and 3) conduct pond larviculture trials stocked at 500,000/ha, attempting to build upon red drum juvenile development techniques.

COMMERCIAL APPLICATIONS:

Development of an economically viable technology, which allows the controlled production of Cobia, will be a major breakthrough in the development of marine seedstock availability. Habituation of wild adults and conditioning for spawning indoors leads to potential opportunities for year-round spawning and production of cobia fingerlings. This accomplishment would be a major stride forward in U.S. marine aquaculture development with a high value fish.

FY 2001 PHASE 1 AWARD WINNER

TOPIC: 8.4 Ocean Science

SUBTOPIC: 8.4.1SG Aquaculture: Developing and Improving Species Culture

TITLE: "Proof of Principle" Study of Myostatin™ (GDF-8) in Regulating Fish Muscle Growth

FIRM: Cape Aquaculture Technologies, Inc.
32 Hook Drive
New Seabury, MA 02649

PRINCIPAL INVESTIGATOR: Philip N. Hamilton
508-883-1081

AWARD AMOUNT: \$49,690

ABSTRACT:

Myostatin™ (Growth and Differentiation Factor-8; GDF-8) expressed in developing somites and adult skeletal muscle has been shown to function as a negative regulator in the control of muscle growth and development in mice and cattle. Disruption of Myostatin™ expression or function in an animal will consequently increase its muscle growth. Mice in which the Myostatin™ gene has been deleted develop increased skeletal muscle mass 2-3 fold greater than that of wild-type mice. Additionally, studies have demonstrated that injection of a Myostatin™ inhibitor into eggs can enhance poultry muscle growth. A homologue of the Myostatin™ gene has been identified in several fish species. In zebrafish, the gene has an expression pattern similar to that in mouse and chick, suggestive that Myostatin™ may play a similar role in regulating fish muscle development and growth. We propose here to use morpholino antisense oligonucleotides to inhibit the translation of Myostatin™ mRNA to protein to study the function of Myostatin™ in regulating muscle growth and development in a member of the commercially important salmonid family. The rainbow trout (*Oncorhynchus mykiss*), with its large eggs and extensively studied development, make it an ideal species for assessing the role of Myostatin™ in controlling fish muscle growth.

COMMERCIAL APPLICATIONS:

A significant improvement in one or more of the following characteristics: percentage live weight as muscle, lower fat content, feed conversion and growth rate is anticipated to have great commercial potential for the aquaculture industry. The ability to generate these changes through the use of an inhibitor given early in development or in the feed, or the use of a vaccine could permit dramatic yield improvements without creating transgenic animals.

FY 2001 PHASE 1 AWARD WINNER

TOPIC: 8.4 Ocean Science

SUBTOPIC: 8.4.5SG Disease Diagnostics and Control

TITLE: Development of Microalgal-Based Vaccines for Fish

FIRM: Phycotransgenics LLC
3416 Ashwood Drive
Bloomington, IN 47401

PRINCIPAL INVESTIGATOR: Richard E. Wagner
812-333-5314

AWARD AMOUNT: \$50,000

ABSTRACT:

One of the major constraints limiting the establishment and profitability of fish farms is the control of disease. The most effective and environmentally compatible strategy for disease control is vaccination. The costs associated with injectable vaccines, however, are high. A more cost-effective and labor reducing means to vaccinate fish is by oral delivery of the vaccine. The major cost factors for oral vaccines are the production, purification, and encapsulation of the antigen. We have developed a novel animal vaccine technology based on the delivery of antigens to fish using transgenic microalgae. Transgenic microalgae have been shown to effectively express model antigens on the cell surface or in the cytoplasm.

The proposed program is directed towards demonstration of the induction of an immune response in fish treated with either live or dead (feed pellets) microalgae expressing antigens. In addition, we propose to generate transgenic algae that express an antigen known to be effective as a vaccine for the protection of fish from disease. Based on current economies of vaccine production, we expect that microalgal oral vaccines will have less than one-third the cost of current oral vaccines.

COMMERCIAL APPLICATIONS:

Successful demonstration of an immune response in fish following oral delivery of antigens expressed in microalgae offers a practical and cost effective alternative to injectable and microencapsulated vaccines. Given the substantial losses (30 - 80%) in the aquaculture industry due to disease, and the environmental concerns regarding the effects of aquaculture on pathogen population dynamics, the development of cost-effective vaccines will have a substantial positive impact on this rapidly growing, multi-billion dollar industry.

FY 2001 PHASE 1 AWARD WINNER

TOPIC: 8.4 Ocean Science

SUBTOPIC: 8.4.7SG Development of Computer Simulation Models for Sediment Transport in Harbors and Ports

TITLE: Simulation Model for Sediment Transport in Harbors and Ports

FIRM: Mechmath LLC
2109 Windsong
Edmond, OK 73034-6528

PRINCIPAL INVESTIGATOR: Eduard Amromin
405-844-2284

AWARD AMOUNT: \$49,900

ABSTRACT:

Sediment transport in harbors and ports significantly affects their maintenance. A novel multi-level computer simulation model is suggested for long-term forecasting of sediment transport. According to this model, the most frequent water waves in harbors (harbor's natural oscillations), significantly influence sediment transfer. A critical point in the model is matching small-scale particle motions with these large-scale waves. The matching relates to a succession of wave-dependent phenomena including wave-induced boundary layers on a sea bottom, sediment dispersion in the high-anisotropy layers, and partial initial motions from seabed. Sediment resuspension is described on a general physic basis with a minimum of empirical coefficients. Besides developing this model and relevant numerical methods, Phase 1 includes validation of the model components with typical simplified flows. Simulation for real harbors is assigned to Phase 2.

COMMERCIAL APPLICATIONS:

The ability to forecast this transport is important for rationalization of dragging and control of pollution transfer. Potential commercialization of the project results can consist of the use of developed numerical tools in elaboration of decisions on (1) dredging in harbors and ports, (2) construction of large structures (like breakwaters or dams), in harbors, (3) location of outlets and deposit places in harbors.

FY 2001 PHASE 1 AWARD WINNER

TOPIC: 8.4 Ocean Science

SUBTOPIC: 8.4.8SG Develop Computer Models/Simulations to Estimate Vessel Hydrodynamics

TITLE: A Computational Tool for Simulating Hydrodynamics Behavior of Multiple Vessels in a Harbor

FIRM: Dynaflow, Inc.
7210 Pindell School Road
Fulton, MD 20759-9752

PRINCIPAL INVESTIGATOR: Jian-Yu Cheng
301-604-3688

AWARD AMOUNT: \$50,000

ABSTRACT:

Prediction of the hydrodynamics of multiple vessels operating in a harbor/waterway is essential to safe and efficient ship operations, reliable harbor maintenance, design, and improvement. However, an efficient predictive model for wide applications is not yet available. We propose to develop a fully non-linear, time domain, computationally efficient boundary element method, to simulate wave-vessel-bank interactions in restricted waters, incorporating wave breaking and wave diffraction from surface piercing structures. The transient loads of moving ships on one another and on banks and coastal structures of realistic geometries will be simulated. Large amplitude ship motions and large slope waves will be modeled. Our goal is to develop a powerful computational simulation and analysis tool for coastal, harbor, and marine engineers and practitioners. This tool will be used to evaluate ship stability and safety in open and restricted waters, to quantify the state of water basins caused by different harbor traffic and to estimate the hydrodynamic loads on coastal structures and banks.

COMMERCIAL APPLICATIONS:

The use of the computational tool developed will allow determination of hydrodynamics of multi-ship interaction, wave loads on bank and shores, near-shore waves for navigation, shipping control, vessel mooring and berthing, traffic scheduling, harbor tranquility, amphibious landing, harbor design and dredging, and tracking of free or loosely-tethered objects. The tool will be able to supply critical engineering evaluation support to supplement empirical testing and, thereby, increase the efficiency while reducing cost, and to assist in making safer and more efficient operations of vessels in a harbor/channel.

FY 2001 PHASE 1 AWARD WINNER

TOPIC: 8.5 Cartography, Photogrammetry, Hydrography, and Geodesy

SUBTOPIC: 8.5.10 Cartographic Data and Geographic Information Systems

TITLE: Multiresolution Raster Chart Digitization and Compression

FIRM: GMA Industries, Inc.
20 Ridgely Avenue, Suite 301
Annapolis, MD 21401

PRINCIPAL INVESTIGATOR: R. Glenn Wright
410-267-6600

AWARD AMOUNT: \$75,000

ABSTRACT:

The proposed research focuses on achieving significant gains in the ability to compress the information contained within raster images of nautical charts in such a manner that aids the characterization and acquisition of metadata pertaining to individual chart features. This is a significant improvement over present NOAA electronic nautical charts, which consist of raster images that are inherently difficult to compress without loss of data, and provide little opportunity for enhancement beyond the mere display of their information. These raster images are, in effect, simply an electronic representation of the old paper charts.

Our approach uses multiple resolutions of the raster image and neural networks to recognize and extract text, symbol, contour, and color data while preserving the original chart features. Data are stored as objects in an electronic database, enabling their future use directly for navigation and information, and lossless compression of the raster chart image is performed to achieve greater compression than is currently possible.

COMMERCIAL APPLICATIONS:

There is a large commercial market for electronic charts as evidenced by the proliferation of computer-based navigation programs at recreational boating and marine industry trade shows. The product of our research represents a new generation of electronic chart with true metadata query capability that would be highly useful to both the recreational boating and professional maritime industries.

FY 2001 PHASE 1 AWARD WINNER

TOPIC: 8.5 Cartography, Photogrammetry, Hydrography, and Geodesy

SUBTOPIC: 8.5.40 GPS-Tracked Buoy for Hydrographic Survey Applications

TITLE: GPS-Tracked Buoy for Hydrographic Survey Applications

FIRM: Neptune Sciences, Inc.
40201 Highway 190 East
Slidell, LA 70461-2443

PRINCIPAL INVESTIGATOR: Marshall D. Earle
504-649-7252

AWARD AMOUNT: \$74,630

ABSTRACT:

A long standing problem in oceanography and hydrography is accurate real-time measurement of offshore water levels. A buoy that uses the Global Positioning System (GPS) to obtain real-time water levels to support hydrographic surveys will be designed and evaluated. Work will draw on the proposer's experience with water levels, buoys, GPS, oceanographic instrumentation development, and determination of wave-induced buoy motions. Previous GPS-tracked buoy research, including work by NOAA, will also be utilized. Considered technical areas will include wave-induced buoy motions and corrections, communications, power, real-time GPS analyses, small vessel deployment constraints, and other issues such as buoy draw-down due to current drag. The overall objective will be to fully determine the feasibility of a GPS-tracked buoy water level measurement system before an operational prototype system is designed in detail, built, and field tested during Phase 2.

COMMERCIAL APPLICATIONS:

Government organizations in many countries and numerous companies would use GPS-tracked buoys to support hydrographic surveys. For example, about 500,000 square nautical miles of the U.S. Exclusive Economic Zone is navigationally significant. Water level data are also important for many research areas. Research users would be a second customer base.

FY 2001 PHASE 2 AWARD WINNER

TOPIC: 8.1 Atmospheric Sciences

SUBTOPIC: 8.1.4R Detection of the Acoustic Airwave from Avalanches: the Basis for a New Warning System

TITLE: Infrasonic Detection of Avalanches

FIRM: Chinook Engineering,
a division of Inter-Mountain Laboratories, Inc.
555 Absaraka
Sheridan, WY 82801-4006

PRINCIPAL INVESTIGATOR: Ernest Scott
307-674-756

AWARD AMOUNT: \$300,000

ABSTRACT:

An automated avalanche detection and alarming system is proposed based on the sub-sonic (infrasonic) signal avalanches create. Phase 1 research confirmed earlier findings that avalanche infrasonic characteristics are unique. However, the strength of the signals recorded in Phase 1 were much lower than indicated in earlier work. Sophisticated spectral processing techniques were employed to positively identify the avalanche against video footage. Our findings prescribe that a robust data set be collected to comprehensively characterize infrasonic source mechanisms, signal strengths, and propagation. Wind and other ambient noise are known to confound avalanche detection. Problems associated with ambient noise will be systematically addressed. The first winter of this project is dedicated to collecting infrasonic avalanche and ambient noise data from a variety of topographies and snow types (Utah, Colorado, Wyoming, Montana). The data set will be used to develop effective detection algorithms and hardware for a prototype system to be operated and tested the second winter. From prototype testing, system specifications and costs will be developed for a commercial system. High country traffic and back country travel are increasing. The development of this technology has significant commercial potential in the U.S. and world-wide, and a real potential to save lives.

COMMERCIAL APPLICATIONS:

Stand-alone or networked systems that detect avalanches in nearby slide areas, warn people in the area, alert emergency response activities.

FY 2001 PHASE 2 AWARD WINNER

TOPIC: 8.1 Atmospheric Sciences

SUBTOPIC: 8.1.5R Modernization of Aging Infrastructure in the National Deposition Program

TITLE: Next Generation Precipitation Samplers for the National Atmospheric Deposition Program

FIRM: Yankee Environmental Systems, Inc.
101 Industrial Blvd.
Turners Falls, MA 01376-1611

PRINCIPAL INVESTIGATOR: Mark C. Beaubien
413-863-0200

AWARD AMOUNT: \$300,000

ABSTRACT:

Since the early 1990s, the NADP has expressed a desire to upgrade the technology in its current network of automated precipitation samplers. These samplers are nearly 25 years old and suffer from a number of reliability as well as basic design problems that may effect the catch efficiency of the sampler and threaten the integrity of the sample (e.g., increase potential contamination of the sample from splash). Common operational problems range from lid freezing, to motor and precipitation sensor failures, to poor accuracy in windy or light precipitation conditions. In addition, new capabilities are desired that are incompatible with the current system, such as additional isolated collection vessels. This will involve adding one or more isolated collection vessels to the existing sampler, new actuators and associated control electronics. In our Phase 1 efforts, we explored several technical approaches that range from an entirely new sampler design to a retrofit of the existing sampler. Our approach leverages the government's significant existing capital investment in the current sampler superstructure in terms of both hardware and operational maintenance experience. By not replacing the entire system we can potentially optimize funds by improving critical areas with the greatest potential for performance enhancement, including improved reliability, ease of data collection, and improved precipitation sensing. A prototype design is described embodying many of the requirements suggested by the NADP management and field personnel.

COMMERCIAL APPLICATIONS:

Although no longer in the public spotlight, acid rain remains a major environmental problem. The NADP program alone operates nearly 230 sites, and when all other countries such as Canada are combined, the total approaches 500 monitoring sites. A "phased replacement" of samplers represents a global market of approximately 100 systems per year over a five year period. Yankee Environmental System, Inc., (YES) a manufacturer of scientific instrumentation intends to build and market these systems through its existing network of sales representatives.

FY 2001 PHASE 2 AWARD WINNER

TOPIC: 8.2 Ocean Observation Systems

SUBTOPIC: 8.2.3R Low-Cost Transportable HF Skywave Radar

TITLE: Low-Cost Transportable HF Skywave Radar

FIRM: CODAR Ocean Sensors, Ltd.
1000 Fremont Avenue
Suite 145
Los Altos, CA 94024

PRINCIPAL INVESTIGATOR: Donald E. Barrick
408-773-8240

AWARD AMOUNT: \$299,801

ABSTRACT:

Decades of research within NOAA/ETL have demonstrated the utility of mapping ocean surface current, waves, and wind fields thousands of kilometers offshore, based on data measured on borrowed time with military skywave HF radars. Thousands of "hits" to ETL's skywave website attest to the widespread interest in these data products. The two ROTHr military facilities are not available, however, for routine monitoring of ocean surface conditions. The initial cost (~\$300M) and annual operating costs (~\$40M) of a ROTHr preclude consideration of a dedicated site for this purpose. The objective of this SBIR was to design a low-cost, affordable, compact alternative to the military system. This has been done under Phase 1. We estimate an operational system can be built for less than 1% of the cost of the military systems. In Phase 2, a skywave prototype test bed will be built in California. It will allow the evaluation of key features of our breakthrough technology, and optimization of the processing algorithms. The innovation that makes this possible is elimination of the huge antennas by employing superdirectivity principles, along with a combination of beam forming and direction finding to determine echo bearing. Nearly all of the remainder of the system is built from commercial off-the-shelf components CODAR manufactures and builds into its SeaSonde family of HF radar products. The patented CODAR waveform and its signal processing is employed to advantage here also.

COMMERCIAL APPLICATIONS:

1) Hurricane/storm observation, warning, and prediction; 2) Marine services, oil spill response, search/rescue; 3) Monitoring dangerous "loop currents" in the Gulf of Mexico; 4) Oceanographic investigations farther removed from shore; 5) Military/defense applications for ocean environmental monitoring around the country's own shores, or to monitor regions where military activities (e.g., amphibious operations) are anticipated or underway. Sales of these systems worldwide could total 50 units, 10 being within the U.S. alone.

FY 2001 PHASE 2 AWARD WINNER

TOPIC: 8.3 Living Marine Resources

SUBTOPIC: 8.3.1F Rapid and Sensitive Methods for the Identification of Viral Pathogens of Shrimp

TITLE: Development of Real-Time PCR Assays for the Detection of Viruses in Penaeid Shrimp

FIRM: Super Shrimp, Inc.
1545 Tidelands Avenue
Suite J
National City, CA 91950

PRINCIPAL INVESTIGATOR: Kurt R. Klimpel
619-477-5394

AWARD AMOUNT: \$277,790

ABSTRACT:

The polymerase chain reaction (PCR) has revolutionized the detection of DNA and RNA. As little as a single copy of a particular sequence can be specifically amplified and detected. Recent advances in PCR chemistry have resulted in a technique which is considerably faster, more specific, and quantitative. The exceptionally flexible SYBR® Green PCR chemistry can be used to design a pathogen detection/diagnostics system ranging from a simplified, extremely rapid assay to a fully automated instrument for high throughput screening. The Phase 1 program was extraordinarily successful and resulted in the development of each key reagent needed to assemble a shrimp viral detection kit. During the Phase 2 portion of this program we will produce prototype shrimp viral detection kits containing a detailed protocol manual and all of the optimized reagents for SYBR® Green PCR to detect each of four shrimp viruses (IHHNV, TSV, WSV, YHV). The prototype kits will be evaluated for their ease of use, shelf life, and ability to detect virus in retail commodity product. Additional second generation primer pairs will be developed simultaneously for incorporation into a second iteration of the shrimp viral detection kit and distributed to independent third party labs for further testing.

COMMERCIAL APPLICATIONS:

During Phase 3, the shrimp detection kit will be produced for sale to three major market sectors including academic organizations, government agencies, and industry groups.

FY 2001 PHASE 2 AWARD WINNER

TOPIC: 8.4 Ocean Science

SUBTOPIC: 8.4.2SG Shrimp Virus Disinfection Techniques for Aquaculture

TITLE: Ozone Disinfection Process for Shrimp Aquaculture

FIRM: Manning International Chemical Systems
202 East Cranford Avenue
Valdosta, GA 31602

PRINCIPAL INVESTIGATOR: Thomas J. Manning
229-242-7045

AWARD AMOUNT: \$173,000

ABSTRACT:

In Phase 1, MICS successfully built and tested a novel ozone process for shrimp farming. The work is based on Patent #6,022,456 and a second patent being filed. In Phase 2, we'll collaborate with the University of Georgia for adaptation to an intensive shrimp farm, and it'll offer production and environmental advantages compared to current technology. We'll establish an economical process to eliminate the devastating effects of viral infections on shrimp farms internationally, as well as control other biological (algae blooms, etc.), chemical (ammonia, dissolved oxygen, etc.), and physical (suspended matter, etc.) Parameters. Phase 2 will be three stages (18 months). The first stage will be the installation, second we'll measure LC50 numbers for shrimp exposed to ozone, and third there will be two-six month trials in six intensive ponds.

COMMERCIAL APPLICATIONS:

An economical, rugged, efficient, novel ozone generation and application process for the shrimp aquaculture industry. It will control devastating viral infections as well as other chemical, physical and biological parameters important in the production of shrimp.

FY 2001 PHASE 2 AWARD WINNER

TOPIC: 8.4 Ocean Science

SUBTOPIC: 8.4.5SG Technology for Sampling Marine Organisms and their Native Environment at Deep-Sea Hydrothermal Vents

TITLE: Cyclops Abyssal Benthic Sampler: (CABS)

FIRM: Cyclops Research & Development, Inc.
340 West 87th Street
New York, NY 10024

PRINCIPAL INVESTIGATOR: Richard P. Sheryll
212-874-2827

AWARD AMOUNT: \$173,000

ABSTRACT:

Cyclops proposes a solution for studying deep-sea microbial biodiversity using a patented sampling methodology and device allowing for retrieval of uncontaminated, undisturbed deep-sea samples while maintaining ambient pressure. Examination of deep-sea microbial ecology is limited by the absence of sampling technology that collects and maintains sample media in the absence of decompression, and assures an uncontaminated and uncompromised sample. The technology employs an innovative controllable interface between the marine environment and the sample chamber. This design, and unique method of operation, have achieved all Phase 1 goals, establishing viability of all core elements of design and operation. Phase 2 objectives will achieve proof of principle by fabricating a fully operational prototype capable of retrieving an abyssal sediment core, including the benthic boundary layer. This embodiment can be modified to retrieve liquid, solid, slurry, or whole organisms, maintain ambient pressure; and preserve the native environment. The technology interoperates with existing surface handling equipment - e.g. a high-pressure isolation/culture chamber and chemostat - to create a system allowing retrieval, transfer, isolation, culture, and the study (in natural environments) of benthic marine organisms (all in the absence of decompression). Phase 2 objectives: Build, test, and operate sampler, and commence retrieval of abyssal sediment cores.

COMMERCIAL APPLICATIONS:

The commercial applications for the technology are supported by the rapid growth of the field of extremophiles. For example, the recent discovery that the actinomycetes (a key source for antibiotics) exists at hydrothermal vents is a primary application to technology. This study of marine actinomycetes could provide the basis for new resistant strains of antibiotics. Other commercial applications for the novel bioactive compounds to be retrieved by Cyclops technology includes enzymology, biotechnology, and any other industry engaging in natural products research.

FY 2001 PHASE 2 AWARD WINNER

TOPIC: 8.4 Ocean Science

SUBTOPIC: 8.4.6SG Disease Diagnostics and Control

TITLE: Cryopreservation and Lyophilization of Live Vaccines for Aquaculture

FIRM: ProFishent, Inc.
17806 N.E. 26th Street
Redmond, WA 98052-5848

PRINCIPAL INVESTIGATOR: David B. Powell
425-881-9244

AWARD AMOUNT: \$173,000

ABSTRACT:

This innovation project will build upon and refine the Phase 1 discovery that certain Arctic and Antarctic bacteria produce materials that, in combination with proprietary substances, greatly enhance the survival and activity of bacteria and viruses during freeze-drying and rehydration. This new technology promises to have direct application to the development of cost-effective, attenuated vaccines for aquatic animals. For live vaccines to be economical, the organisms must survive long enough in sufficient numbers to stimulate protective humoral, and especially cellular, immune responses. *Flavobacterium columnare*, attenuated *Edwardsiella ictaluri* bacteria, and infectious hematopoietic necrosis virus (IHNV) will be used as model organisms to assess the potency of more highly purified cryopreservatives. Detailed plans and strategies will also be developed to prepare for regulatory testing, patent application, product development, and various marketing approaches in Phase 3.

The use of live vaccination has already become a crucially important approach to the improvement of human and livestock health (Janeway and Travers 1994, Tolud 1997). This will almost certainly hold true for aquatic animals as well.

COMMERCIAL APPLICATIONS:

Phase 3 developments of this technology will produce a new generation of aquaculture vaccines that will substantially reduce losses to disease. These live products can be readily applied to marine and fresh water animal stages too small to inject. The lack of adverse effects to biological recirculation filters will be an added benefit. It should be possible to vaccinate and raise a variety of aquatic species previously thought to be too susceptible to pathogens.

**U.S. DEPARTMENT OF COMMERCE/NOAA
PROPOSALS AND AWARDS
BY STATE FOR FY 2001**

STATE	PROPOSALS	PH 1 AWARDS	PH 2 AWARDS*
AK	0	0	0
AL	3	0	0
AR	0	0	0
AZ	2	0	0
CA	6	0	2
CO	7	1	0
CT	0	0	0
DC	0	0	0
DE	0	0	0
FL	3	0	0
GA	0	0	1
HI	0	0	0
IA	0	0	0
ID	0	0	0
IL	0	0	0
IN	1	1	0
KS	0	0	0
KY	0	0	0
LA	1	1	0
MA	10	2	1
MD	7	3	0
ME	0	0	0
MI	0	0	0
MN	2	0	0
MO	0	0	0
MS	0	0	0

STATE	PROPOSALS	PH 1 AWARDS	PH 2 AWARDS
MT	2	2	0
NC	0	0	0
ND	1	0	0
NE	0	0	0
NH	0	0	0
NJ	1	0	0
NM	0	0	0
NV	0	0	0
NY	0	0	1
OH	1	0	0
OK	2	1	0
OR	2	1	0
PA	0	0	0
PR	0	0	0
RI	0	0	0
SC	3	1	0
SD	0	0	0
TN	3	0	0
TX	0	0	0
UT	1	0	0
VA	4	0	0
VT	0	0	0
WA	7	0	1
WI	1	0	0
WV	0	0	0
WY	0	0	1
TOTALS	70	13	7

* From FY 2000 Phase 1 awardees.